REMARKS

Claims 1-32 are pending in the application. Claims 1-30 have been examined and stand rejected. Claims 1-3, 6, 7, 13, 17, 20, 24 and 27-30 have been amended to more clearly define the invention. New claims 31-32 have been added. Reconsideration and allowance of the claims are respectfully requested.

THE CLAIMS

Rejection of Claims 1-12, 15, 16 and 19-30 Under 35 U.S.C. §103(a)

Claims 1-12, 15, 16 and 19-30 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Isaka *et al* (U.S. Patent Publication 2002/0138254) in view of Erten (U.S. Patent Publication 2002/0009203). The rejection indicates that Isaka discloses all of the elements of these claims except that "the speech processing apparatus mounted on a mobile communication device, the signal detectors forming a small array." The rejection states that Erten describes "a mobile communication device in figure 9 comprising a microphone array."

Isaka Reference

Isaka describes a speech processing apparatus that receives input speech signals from multiple channels and generates an output speech signal. (See Fig. 10.) The apparatus includes beam formers **91** and **92**. First beam former **91** filters the input speech signals to suppress a signal from a target source and provides a noise signal. Second beam former **92** filters the input speech signals to suppress noise and extract the signal from the target source and provides a speech signal. Section **93** estimates the direction of the target source based on the filter coefficients for beam former **91**, and controller **94** sets the target direction for beam former **92** to the estimated target source direction. Conversely, section **95** estimates the direction of a noise source based on the filter coefficients for beam former **92**, and controller **96** sets the target direction for beam former **91** to the estimated noise source direction. (See paragraph [0116].)

Isaka also describes a prior art method for improving S/N ratio using an adaptive array of a small number of microphones. Isaka concludes, however, that with this method, it is difficult to improve the S/N ratio in an environment where the S/N ratio is low because there is so many noise sources that their directions cannot be identified.

(See paragraph [0005].) Isaka is presumably able to improve the S/N ratio by having beam formers **91** and **92** track the directions of the noise and target sources, respectively.

Claim 1 of the Present Invention

Claim 1 of the present invention, as amended, recites:

> "A mobile communication device comprising:
>
> a plurality of signal detectors mounted on the mobile communication device, the plurality of signal detectors being placed in close proximity to one another and forming a small array, each signal detector configured to provide a respective detected signal having a desired component plus an undesired component;
>
> a first beam forming unit operatively coupled to the plurality of signal detectors and configured to process the plurality of detected signals to generate a first signal having the desired component plus a portion of the undesired component;
>
> a second beam forming unit operatively coupled to the plurality of signal detectors and configured to process the plurality of detected signals to generate a second signal having mostly the undesired component;
>
> a controller operatively coupled to the first and second forming units and configured to enable the first beam forming unit to adapt during periods of speech activity and to enable the second beam forming unit to adapt during periods of non-speech activity; and
>
> a noise suppression unit operatively coupled to the first and second beam forming units and configured to receive and digitally process the first and second signals and to provide an output signal having substantially the desired component and a large portion of the undesired component removed."

Applicant submits that claim 1 is patentable over Isaka in view of Erten for at least the following reasons.

First, Isaka and Erten do not describe "a controller ... configured to enable the first beam forming unit to adapt during periods of speech activity and to enable the second beam forming unit to adapt during periods of non-speech activity," as recited in claim 1. Instead, Isaka determines the directions of the target and noise sources based on the filter coefficients for beam formers **91** and **92**, respectively, and then operates beam formers **91** and **92** to track the directions of the noise and target sources, respectively.

Isaka does not control the operation of the beam forming units in the manner recited in claim 1.

Second, there is no motivation to combine Isaka and Erten. These two references appear to describe different problems and propose different solutions. Isaka relies on the ability to track the directions of the target and noise sources. The two beam formers **91** and **92** of Isaka are able to track one target source and one noise source. In contrast, Erten relies on proper placement of the microphones to achieve good separation between speech signal and noise, e.g., see Figs. 1, 2, and 4. Erten contemplates noise from multiple sources, e.g., see Fig. 2. Fig. 9 of Erten shows five hand-held devices, each having two microphones. The two beam formers **91** and **92** of Isaka (which are the most beam formers possible with two microphones) would not be able to track multiple noise sources shown in Fig. 2 of Erten. Hence, there is no motivation to use the beam formers of Isaka with the hand-held devices of Erten.

Thus, Applicant submits that claim 1 is patentable over Isaka in view of Erten. Claims 1-12, 15, 16 and 19 are dependent on claim 1 and are also patentable over Isaka in view of Erten for at least the reasons noted above for base claim 1. These dependent claims may recite features not described by Isaka or Erten.

For example, claim 2 recites "each adaptive filter in the first set configured to filter a respective detected signal to minimize an error between an output of the adaptive filter and a designated detected signal during the periods in which the first beam forming unit is enabled, and ... each adaptive filter in the second set configured to filter a respective detected signal to minimize an error between an output of the adaptive filter and the second signal during the periods in which the second beam forming unit is enabled." The beam forming units recited in claim 2 can recover desired components from multiple target sources and undesired components from multiple noise sources. In Isaka, each of the two beam formers is controlled based on the direction for one source, which is estimated with the other beam former.

Independent claims 20 and 27 have each been amended to recite features similar to that described above for claim 1. Claims 21-26 are dependent on claim 20, and claims 28-30 are dependent on claim 27. These claims are patentable over Isaka in view of Erten for the reasons noted above for base claim 1.

Accordingly, the §103(a) rejection of claims 1-12, 15, 16 and 19-30 should be withdrawn.

Rejection of Claims 13, 14, 17 and 18 Under 35 U.S.C. §103(a)

Claims 13, 14, 17 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Isaka in view of Erten and further in view of Anderson *et al.* (U.S. Patent No. 6,453,285). The rejection states that the combination of Isaka and Erten does not disclose a voice activity detector (VAD). The rejection states that Anderson discloses this VAD.

Applicant submits that claims 13, 14, 17 and 18 are patentable over Isaka in view of Erten and further in view of Anderson for at least the following reasons. First, claims 13, 14, 17 and 18 are dependent on claim 1, and the combination of Isaka and Erten does not describe all of the limitations of base claim 1 for the reasons noted above. Thus, the combination of Isaka and Erten is an insufficient basis for the §103(a) rejection of claims 13, 14, 17 and 18.

Second, there is no motivation to combine Anderson with Isaka and Erten. Isaka detects speech interval based on time series of target speech direction in the second embodiment shown in Fig. 8. (See paragraphs [0082], [0083] and [0114].) Isaka "performs speech enhancement rather than detects a speech interval" in the third embodiment shown in Fig. 10. (See paragraph [0115].) The second and third embodiments appear to be mutually exclusive, i.e., speech interval detection in Fig. 8 or speech enhancement in Fig. 10. Thus, Isaka teaches away from using the VAD of Anderson with the third embodiment shown in Fig. 10.

Accordingly, the §103(a) rejection of claims 13, 14, 17 and 18 should be withdrawn.

New Claims 31 and 32

New claims 31 and 32 recite additional features of the invention. Support for these claims is given in paragraphs [174] to [178] and FIGS. 7A and 7B of the present application. These claims recite features not described by Isaka, Erten or Anderson.

CONCLUSION

Applicant believes all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (650) 289-0600.

Respectfully submitted,

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